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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/674,903	09/30/2003	Andrea Lorenzo Vitali	851763.441	9001

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EXAMINER	
CZEKAJ, DAVID J	

ART UNIT	PAPER NUMBER
2621	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/674,903	VITALI ET AL.	
	Examiner	Art Unit	
	DAVID CZEKAJ	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _29 August 2008_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-18,20-43,45-55 and 58-62_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-16,21,23,24--41,46,48,49,50, 51-55 and 58-62_ is/are rejected.

7)☒ Claim(s) _17,18,20,22,42,43,45 and 47_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

On page 15, applicant argues that Maeda fails to disclose the same quantization step for the pixels in the block. While the applicant's points are understood, the examiner respectfully disagrees. The examiner relied upon Aravind, not Maeda, to teach the claimed limitations. Therefore the rejection has been maintained.

On page 15, applicant argues that Aravind fails to disclose the same quantization step for the quantizer applied to each pixel within a block. While the applicant's points are understood, the examiner respectfully disagrees. See for example Aravind column 4, lines 45-53. There Aravind discloses that only one quantization parameter need be developed for each macroblock. Since each block is processed using a quantization parameter, Aravind is using the same quantization step for each pixel located within the block. Therefore the rejection has been maintained.

On pages 16-17, applicant argues that Maeda fails to disclose repeated application in a spatial domain instead of the frequency domain. While the applicant's points are understood, the examiner respectfully disagrees. See for example Maeda column 12, lines 47-55. There Maeda discloses performing vector quantization directly without applying an orthogonal transform. By performing the quantization directly on the input, Maeda is applying the quantization in the spatial domain. Therefore the rejection has been maintained.

On page 17, applicant argues that Maeda fails to disclose an adaptive quantization. While the applicant's points are understood, the examiner respectfully

disagrees. The examiner did not rely upon Maeda to teach the adaptive quantization. Therefore the rejection has been maintained.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 51-55 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The computer readable medium found the claims cannot be located in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 9, 10, 15, 23, 24, 26, 27, 34, 35, 40, 48, 49, 51, 54, 55, 58, 59, 60, and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,214,507 to Aravind et al. in view of 'Sequential Scalar Quantization of Vectors: An Analysis' to Balasubramanian et al. in further view of US Patent 5,341,441 to Maeda et al.

[claims 1, 26, 51 and 58]

Figure 1 of Aravind teaches a process and system for converting video signals having images organized in blocks of pixels between a first format (VIDIN) and a second format (DCTERRQ), said second format being a format compressed via vector quantization (Col 3 line 17-30 and Col 4 Lines 15-17).

Aravind teaches the use of a perceptual noise sensitivity based method for determining the quantization step size (Abstract). This method includes the determining the quantization step in an adaptive way according to characteristics of the pixels in the spatial domain (Col 4 Lines 17-40). The obtaining of the quantization step includes identifying a sharpness value of edges in each of said blocks of pixels, and quantizing said sharpness value to divide the edges into a number of classes (Col 10 Lines 53-67, Table 4). The process attributes a value (qp) to said quantization step differentiated according to the classes, wherein the value of the quantization step is increased near the edges of said images having said pixels (Col 8 Lines 32-59, Col 13 Lines 27-41). As shown in Figure 1, all of the blocks are quantized in the quantizer (120) which uses a base quantizer step size matrix along with the variable qp to determine an adjusted step for each block (Col 4 Lines 17-21). Aravind further discloses the quantization step is used for the quantizer applied to each pixel within a block (Aravind: column 4, lines 45-53). Aravind is silent on the video signal being digital, the specific operation of the quantizer and the quantizing in the spatial domain.

Balasubramanian teaches the use of vector quantization for image compression (First Paragraph of I. Introduction). Balasubramanian further teaches a computationally

simple approach to Vector Quantization is to perform scalar quantization on each component (III. Scalar Quantization of Vectors). It would have been obvious to one of ordinary skill in the art at the time of the invention to use scalar quantization to perform vector quantization for quantizing the image data of Aravind as Balasubramanian teaches the use of vector quantization for image compression and the use of scalar quantization as a computationally simple means of vector quantizing (First Paragraph of I. Introduction, III. Scalar Quantization of Vectors). Balasubramanian is silent on the video signal being digital and performing the quantization in the spatial domain.

Maeda teaches the performing of vector quantization on digital image information (Abstract). Maeda further teaches the performing of vector quantization on pixels in the transform domain (Fig. 1). Maeda also teaches an alternative embodiment of performing quantization directly on pixels in the spatial domain (Col 12 Lines 47-63, Fig. 8). It would have been obvious to one of ordinary skill in the art at the time of the invention to perform the process of Aravind and Balasubramanian on the digital pixels in the spatial domain as Maeda teaches performing vector quantization on digital image data and the bypassing of an orthogonal transform as a modification of the process (Abstract, Col 12 Lines 39-63).

In regards to claim 51, Aravind further teaches the use of a computer-readable medium encoded with a computer program (Col 14 Lines 38-50).

[claims 2, 27, and 59]

As shown above, Aravind teaches the quantization step is obtained by multiplying the variable qp with a respective element of the base quantizer step size

matrix (Col 4 lines 17-21). The variable qp is increased according to a lack of uniformity of the pixels in the block (Col 4 Lines 46-53 and Col 11 Line 16-31, Table 4). Note: by increasing the variable qp the resulting step size is increase since the step size is obtained by the multiplying the variable qp with a respective element of the base quantizer step size matrix.

[claims 9, 23, 34, 48, 54 and 60]

Aravind teaches the re-ordering of the pixels in each block to be quantized such that the pixels are divided into luminance and chrominance subblocks (Col 3 Lines 47-57). Aravind is silent on the quantization of the chrominance subblocks.

Maeda teaches an embodiment for processing color images (Fig. 2). The images are obtained as RGB data and converted to luminance (L*) and chrominance values (a* and b*). These values are then processed separately (22, 23, and 24). Maeda further teaches the RGB signal can be converted to YCrCb (Col 17 Lines 50-54). It would have been obvious to one of ordinary skill in the art at the time of the invention to adapt the quantizer of Aravind to quantize luminance and chrominance as taught by Maeda in order to process color images (Col 13 Lines 30-34).

[claims 10 and 35]

Aravind further teaches identifying in a context of said digital video signals, blocks of uniform pixels (Col 6 Line 50-Col 7 Line 8). Aravind further teaches choosing a minimum quantization step among quantization steps for the identified blocks (Col 4 Lines 41-51, Col 7 Lines 39-50).

[claims 15, 40, 55, and 62]

Aravind is silent on said vector quantization is a multi-dimensional vector quantization resulting from concatenation of a plurality of vector quantizations, each resulting from repeated application of a scalar quantization.

Balasubramanian teaches the use of vector quantization for image compression (First Paragraph of I. Introduction). Balasubramanian further teaches a computationally simple approach to Vector Quantization is to perform scalar quantization on each component (III. Scalar Quantization of Vectors). It would have been obvious to one of ordinary skill in the art at the time of the invention to use scalar quantization to perform vector quantization for quantizing the image data of Aravind as Balasubramanian teaches the use of vector quantization for image compression and the use of scalar quantization as a computationally simple means of vector quantizing (First Paragraph of I. Introduction, III. Scalar Quantization of Vectors). Balasubramanian is silent on a multi-dimensional vector quantization.

As shown in Figure 7, Maeda teaches the use of a multi-dimensional vector quantization resulting from concatenation of a plurality of vector quantizations (Col 10 Lines 52-55). Maeda further teaches the vector quantization results from repeated application of a scalar quantization (15, Fig. 7). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the multi-dimensional vector quantization method of Maeda with the process of Aravind and Balasubramanian in order to quantize image data (Col 1 Lines 11-16).

[claims 24 and 49]

Aravind teaches the performing of the process only on luminance macroblocks. Aravind further teaches the macroblocks comprise adjacent pairs of pixels (Col 3 Lines 47-57).

Claims 3-8, 13, 14, 21, 28-33, 38, 39, 46, and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aravind, Balasubramanian and Maeda as applied to claim 1 above, and further in view of US Patent 6,463,100 to Cho et al. [claims 3, 4, 7, 28, 29 and 32]

Aravind, Balasubramanian and Maeda teach the process of claim 1 and system of claim 26. Aravind is further shown to teach the requirements of claim 2. Aravind determines the quantization step size based on perceptual noise sensitivity. Perceptual noise sensitivity is based on such features as presence of edges and brightness of the region (Col 4 Lines 22-40). Aravind further teaches the importance of determining overly bright or overly dark regions in order to determine the correct Perceptual noise sensitivity class (Col 9 Lines 22-27 and Lines 35-46, Table 1). Aravind, Balasubramanian and Maeda are silent on the specific equation used to incorporate brightness in the calculation of quantization step size.

Cho teaches a similar process for converting video signals between a first format and a second format wherein a quantization step size is determined in an adaptive way according to characteristics of the pixels (Abstract, Col 3 Lines 29-40, Col 8 Lines 47-60, Figs. 3 and 4). As required by claims 3 and 28, Cho teaches wherein said quantization step is determined by a law increasing according to multiples (Col 10 Lines 44-45). Note: Equation 15 shows the step value (mquant) is equal to mquant or

2*mquant based on the Luminance value. As shown in the equation, the quantization step increases as a function of said level of brightness (Col 10 Lines 40-45). The equation further uses the average luminance as required by claims 7 and 32. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the determining step of Cho with the process and system of Aravind, Balasubramanian and Maeda as Cho teaches bits may further be saved by utilizing the fact that the sight of humans deteriorates for image quality in a very bright or dark place (Col 10 Lines 25-33).

[claims 5, 6, 30, 31, and 53]

As shown above Aravind, Balasubramanian and Maeda teach the process of claim 1, system of claim 26 and article of manufacture of claim 51. Aravind further teaches the quantization step is determined based on a lack of uniformity of the pixels in a block and level of brightness (Col 4 Lines 27-40). Aravind further teaches the determining of the quantization step is based on the detected characteristics (Col 4 Lines 41-53). Aravind, Balasubramanian and Maeda are silent on the determining said quantization step in such a way that said quantization step first increases and then decreases as a function of said lack of uniformity and said level of brightness.

Cho teaches a similar process according to claim 1 comprising detecting a lack of uniformity of the pixels in a block (Col 4 Lines 38-50) and detecting a level of brightness of the pixels in the block (Col 10 Lines 40-45). Cho further teaches determining said quantization step in such a way that said quantization step first increases and then decreases as a function of said lack of uniformity and said level of

brightness (Col 5 Lines 7-16, Fig. 3). Cho further teaches the quantization step is made to increase and decrease by multiples or sub-multiples as required by claim 6 (Col 8 Lines 32-37 and Col 10 Lines 40-45). Note: Equation 15 teaches the use of multiples while Equation 11 teaches the use of sub-multiples. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the method of Cho with the process, system and article of manufacture of Aravind, Balasubramanian and Maeda as an alterative to the tables used by Aravind since the equation of Cho performs the same operation of adjusting the quantization step based on characteristics of the block (Col 4 Lines 38-50).

[claims 8, 13, 14, 33, 38 and 39]

Aravind teaches the use of the quantization process with an MPEG encoding system (Col 1 Lines 31-40 and Col 4 Lines 51-53). Aravind, Balasubramanian and Maeda are silent on the other features of an MPEG encoding system.

As shown in Figure 4, Cho teaches a system for encoding video into the mpeg format. The system includes a multiplexing (113) of at least one part of digital data necessary for representation of an image (Col 1 Lines 6-12). Cho further teaches the signal compressed via vector quantization is subjected to entropic encoding (112) as required by claim 13. Cho specifically teaches variable length encoding which is well known in the art to incorporate run-length encoding, Huffman encoding or arithmetic encoding (Official Notice). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the multiplexing and entropic encoding means of Cho

with the process and system of Aravind, Balasubramanian and Maeda in order to provide a compliant mpeg encoder as taught by Cho (Col 1 Lines 6-12).

[claims 21 and 46]

As shown above, Aravind, Balasubramanian, Maeda and Cho teach the requirements of claims 4 and 29. Aravind teaches the determining of the brightness as very high, very low or moderate brightness (Col 9 Lines 22-27 and Lines 35-39). The citation further teaches the selection of the qp variable based on the classification. As shown above, the qp variable is used to determine the quantization step (Col 4 Lines 17-21).

Claims 11, 12, 36, 37 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable Aravind, Balasubramanian and Maeda as applied to claims 1, 26 and 61 above, and further in view of Cho and US Patent 5,731,836 to Lee.

[claims 11, 12, 36, 37 and 61]

As shown above Aravind, Balasubramanian and Maeda teach the process of claim 1 and systems of claim 26 and 58. Aravind teaches the use of the quantization process with an MPEG encoding system (Col 1 Lines 31-40 and Col 4 Lines 51-53). Aravind, Balasubramanian and Maeda are silent on the other features of an MPEG encoding system.

As shown in Figure 4, Cho teaches a system for encoding video into the mpeg format. Cho further teaches the motion compensation steps as shown in Figure 4 (105, 106, 108, 109, 102). Cho is silent on such steps being a DPCM scheme. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the

multiplexing and entropic encoding means of Cho with the process of Aravind, Balasubramanian and Maeda in order to provide a compliant mpeg encoder as taught by Cho (Col 1 Lines 6-12).

Lee teaches a similar motion compensation means as a hybrid DCT/DCPM (Col 1 Lines 13-25, Fig. 1). It would have been obvious to one of ordinary skill in the art at the time of the invention that the motion compensation steps of Cho is a DCPM as suggested by Lee.

Claims 16 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,214,507 to Aravind et al. in view of 'Sequential Scalar Quantization of Vectors: An Analysis' to Balasubramanian et al. in further view of US Patent 5,341,441 to Maeda et al. in further view of Stopler (6625219).

Regarding claims 16 and 41, note the examiners rejection for claim 1, and in addition, claims 16 and 41 differ from claim 1 in that claims 16 and 41 further require assigning binary codes based on distance. Stopler teaches that prior art processing systems produce large amounts of latency when processing video data (Stopler: column 5, lines 1-7). To help alleviate this problem, Stopler discloses "binary codes of reconstruction points are assigned n such a way that the points with small distance have binary codes with small difference" (Stopler: column 4, liens 23-33). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to implement the codes taught by Stopler in order to obtain an apparatus that better helps reduce latency in video processing systems.

Claims 25 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,214,507 to Aravind et al. in view of 'Sequential Scalar Quantization of Vectors: An Analysis' to Balasubramanian et al. in further view of US Patent 5,341,441 to Maeda et al. in further view of De Haan et al. (6385245), (hereinafter referred to as "Haan").

Regarding claims 25 and 50, note the examiners rejection for claim 1, and in addition, claims 25 and 50 differ from claim 1 in that claims 25 and 50 further require a quincunx pattern. Haan teaches that sampling using a quincunx pattern saves processing power (Haan: column 12, line 65 - column 13, line 3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to implement the quincunx pattern in order to save processing power of the video system.

Allowable Subject Matter

Claims 17-18, 20, 22, 42-43, 45, and 47 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID CZEKAJ whose telephone number is (571)272-7327. The examiner can normally be reached on Mon-Thurs and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dave Czekaj/
Primary Examiner, Art Unit 2621